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# (54) Expanding pipe stopper

(57) The stopper, for sewer pipes and similar applications, comprises an annular rubber seal 68 located between the peripheries of two rigid circular plates 60, 64 and means to force the plates towards each other to compress and thus radially expand the seal 68. To provide easier securing than heretofore and the possibility of remote release, a spigot 70 is fixed to the centre of one plate 60 and extends through a central hole 76 in the other plate 64, a collar 80 is connected to that part of the spigot which extends from the other plate, and cam plates 84 are pivotable about a diametrical axis 88 on the collar by a hand lever 90 fixed to the cam plates between one position in which the circular plates 60 and 64 do not compress the seal 68 located between them and another position in which the cam plates force the circular plates towards each other so as to compress and radially expand the seal. Bracing of the stopper is by a second hand lever or a foot 98.

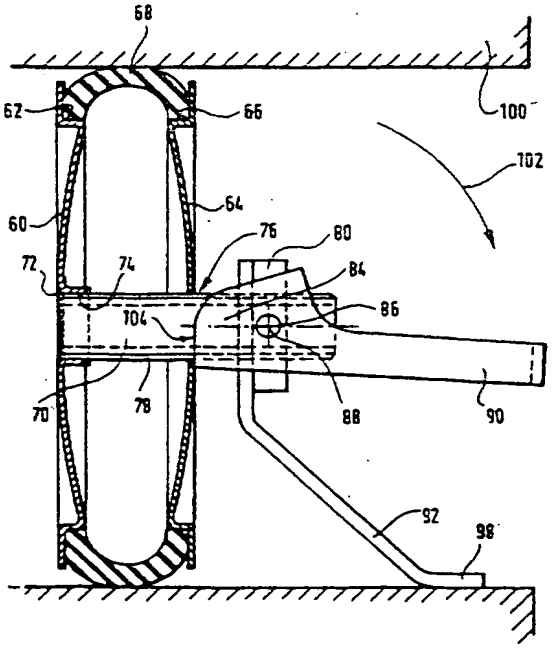


Fig.4.



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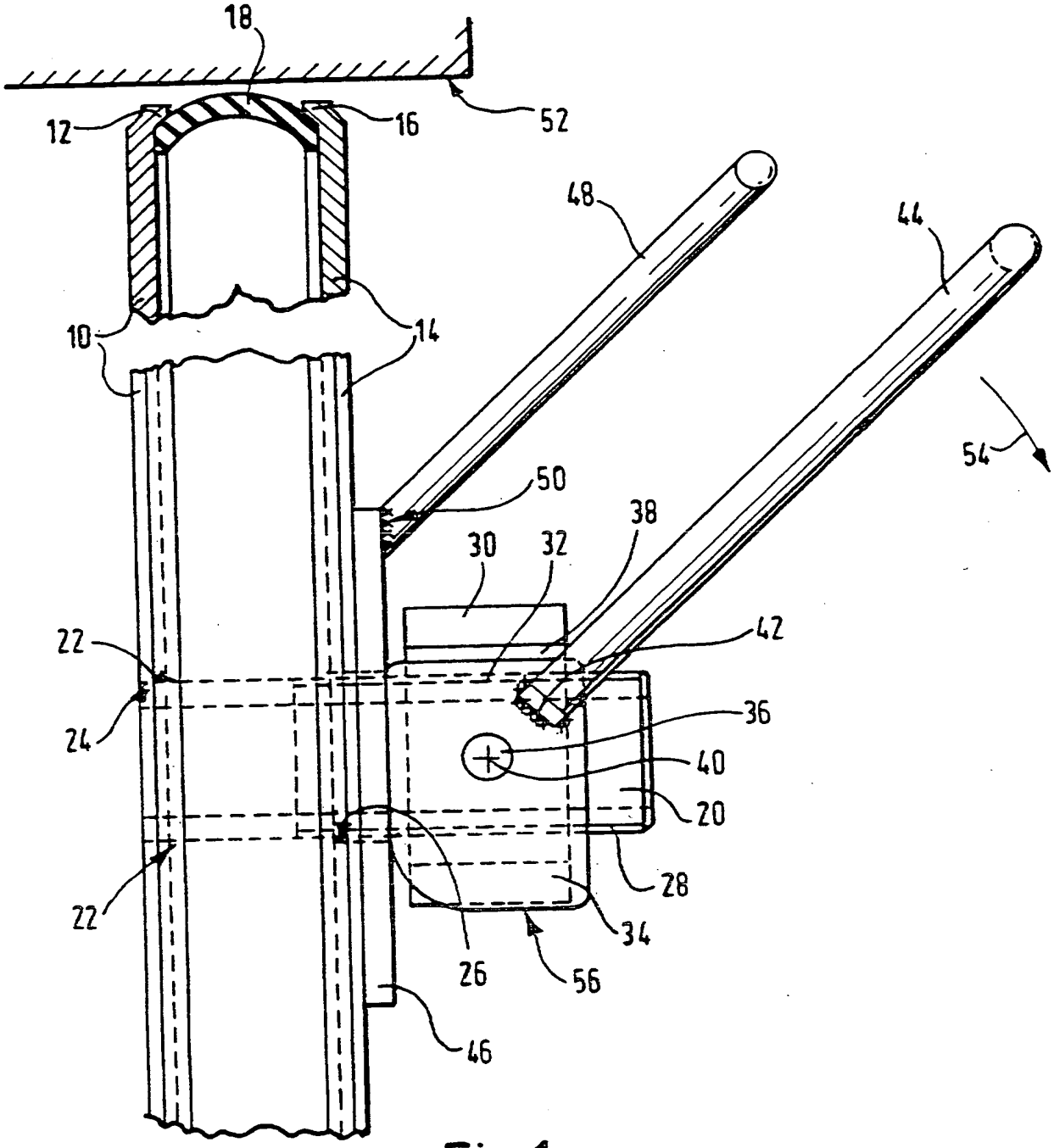
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Fig.1.

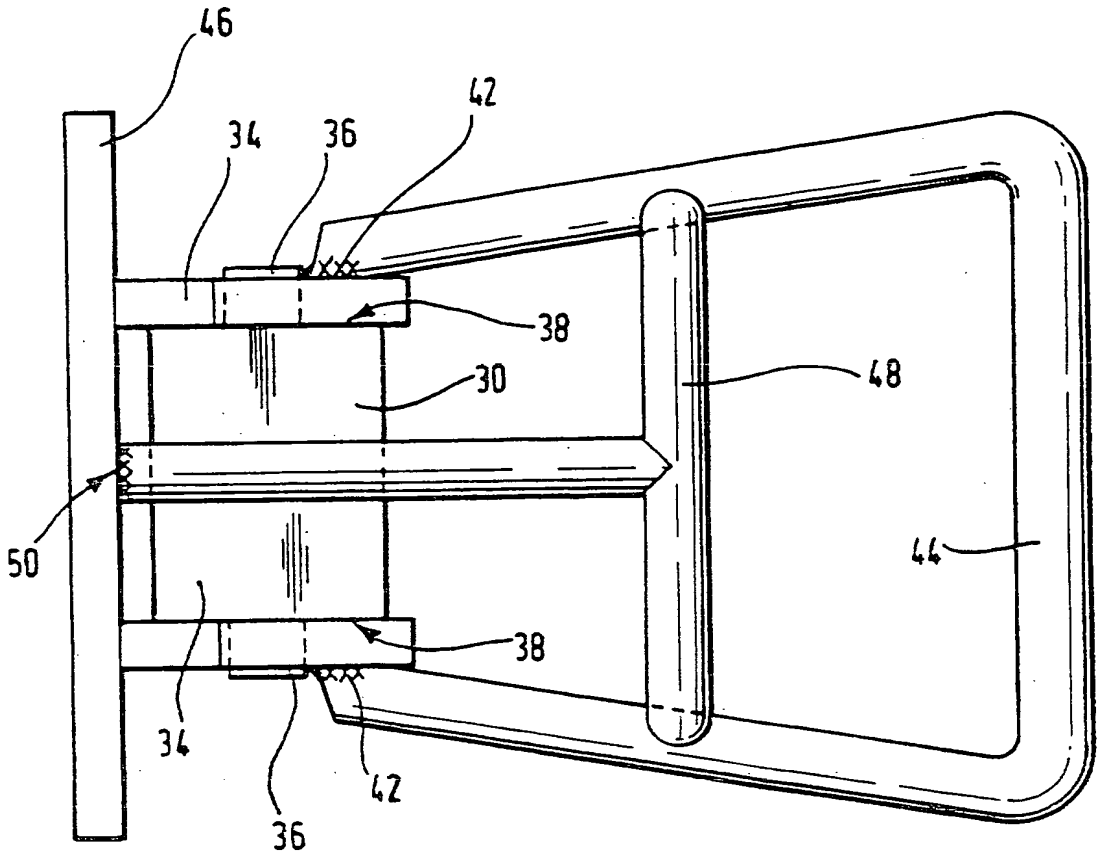


Fig.2.

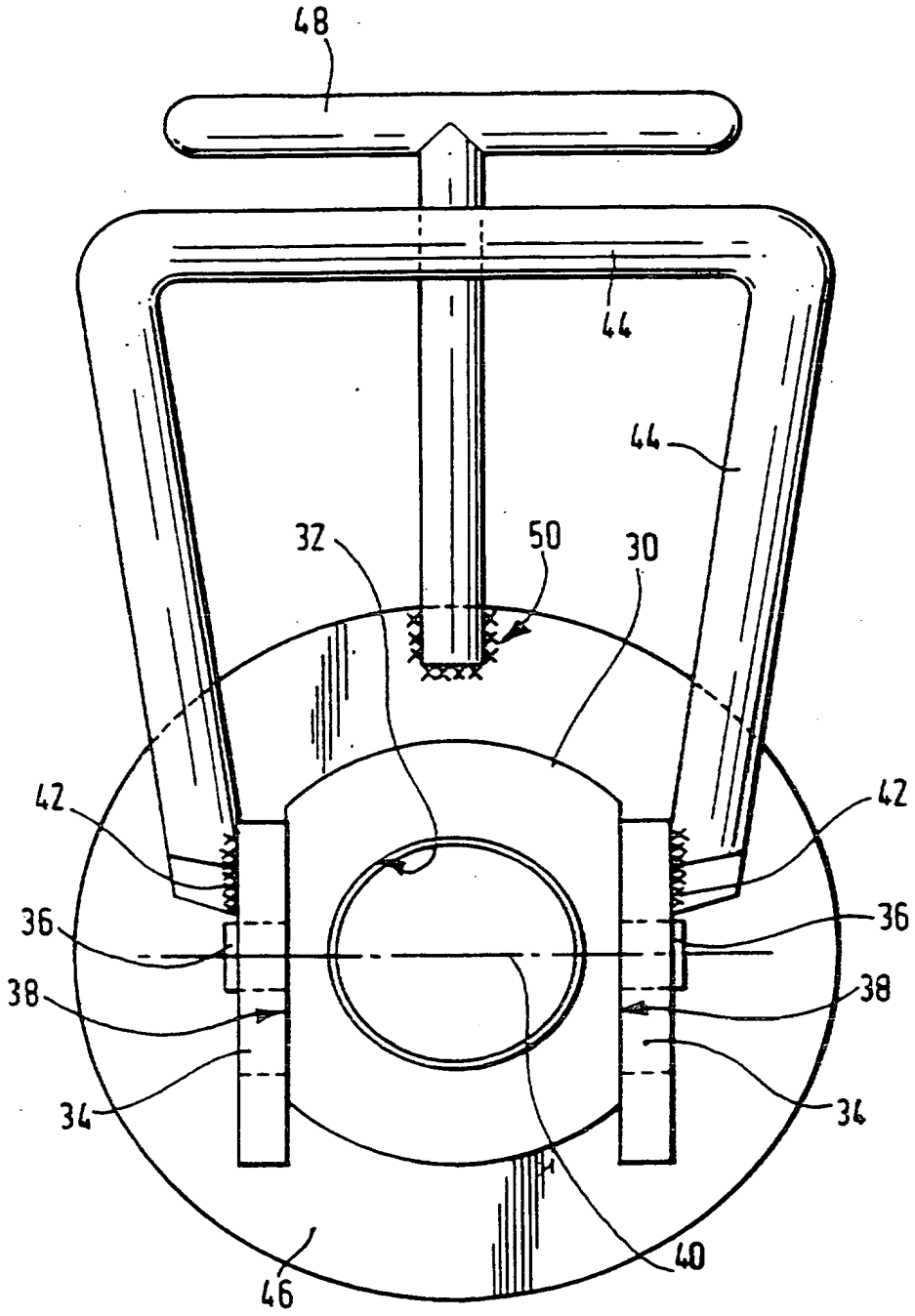


Fig.3.

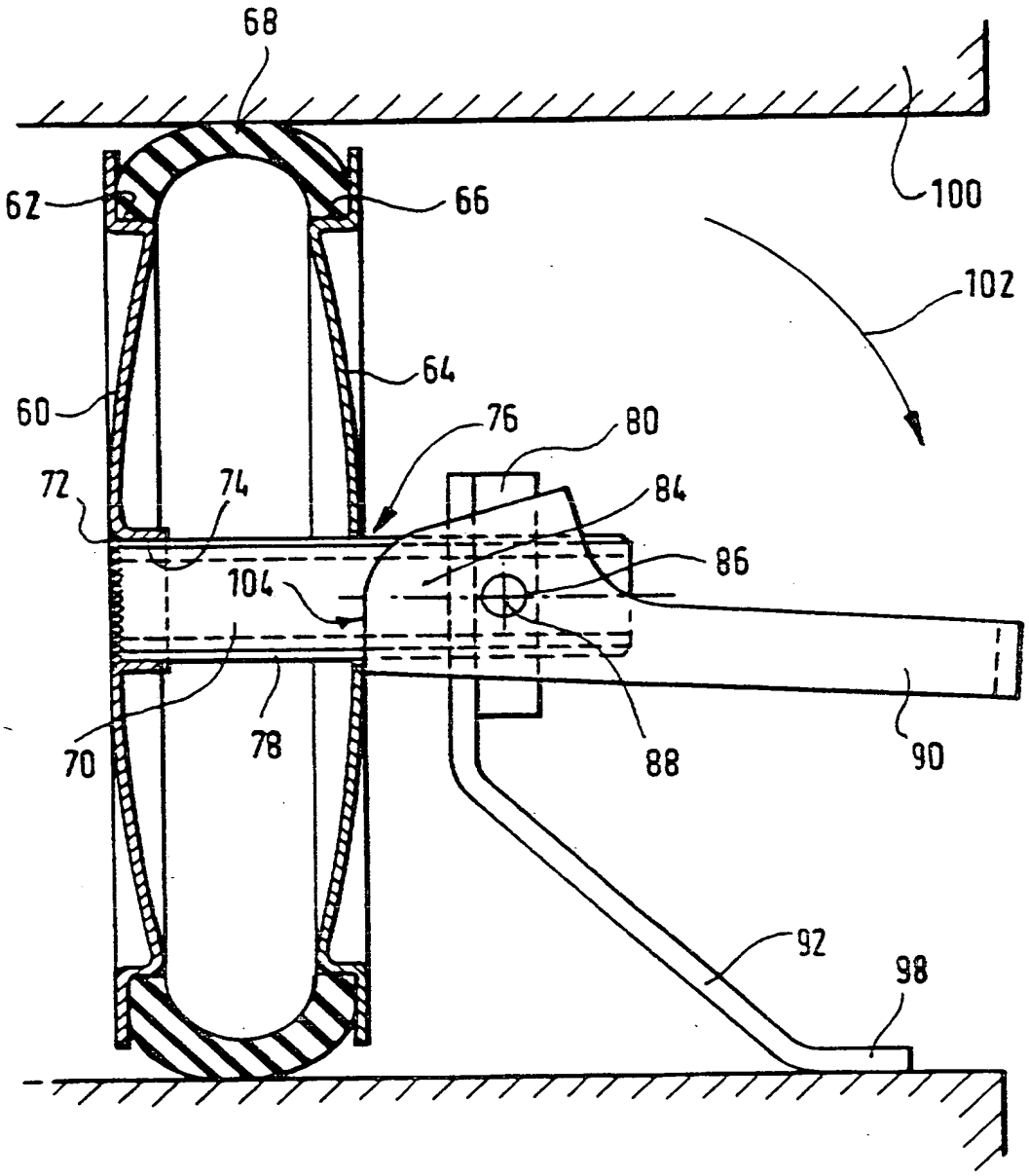


Fig.4.

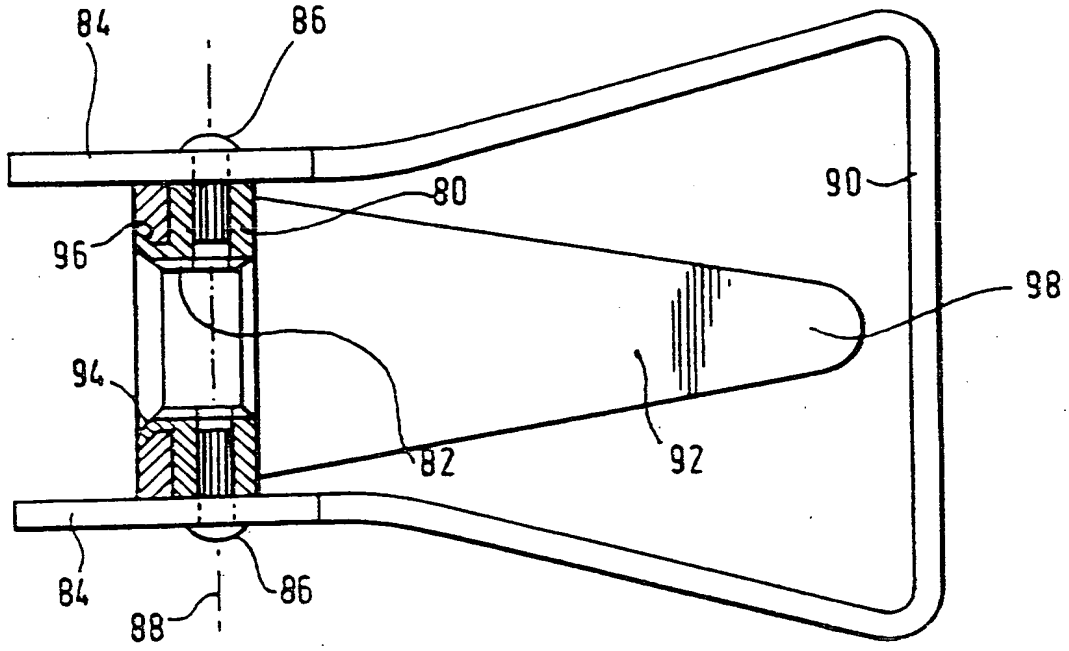


Fig.5.

"An Improved Expanding Pipe Stopper"

This invention relates to an improvement in expanding pipe stoppers for sewer pipes, industrial applications or the like, also known as drain plugs, or bungs.

Conventional expanding pipe stoppers comprise two rigid circular plates, an outwardly-curved annular rubber seal located between the adjacent peripheral surfaces of said plates so as to project radially therefrom, an externally screw-threaded spigot fixed to the centre of one of said plates and extending through a central hole in the other of said plates, an internally screw-threaded collar mounted on the spigot on that side of said other plate remote from said one plate, and either two diametrically-opposed hand levers fixed to the collar or, in the case of small pipe stoppers, a hand grip formed on the collar, for turning the collar to compress and expand or to release the seal. For some applications the spigot is axially extended and is surrounded by a tube interposed between said other plate and the collar, said tube having fixed to it three radial arms of such length as to centralise it in a pipe.

The conventional stoppers are not easy to secure in operative position within a pipe, as it is quite difficult to restrain said other plate against rotation and hold it in position with one hand whilst tightening the collar by turning the hand levers on the hand grip with the other

hand. Furthermore, as the release of such stoppers must be effected manually, a person performing this operation of necessity down a man-hole is frequently badly soiled by the resulting sudden release of a build-up of sewage or other liquids or in the case of larger pipes, is subjected to the risk of being swept off his feet or possibly endangered by abrupt flooding of the man-hole.

The object of the present invention is to facilitate the securing of an expanding pipe stopper in operative position. A subsidiary object is to enable the stopper to be released remotely.

According to the invention, an expanding pipe stopper comprises two rigid circular plates of substantially the same diameter, an outwardly-expandable annular rubber seal located between the two adjacent peripheral surfaces of said plates so as to be capable of projecting radially therefrom, a spigot fixed to the centre of one of said plates and extending through a central hole in the other of said plates, a collar connected to the spigot on that side of said other plate remote from said one plate, and cam means pivotable about a diametrical axis on the collar by a hand lever fixed to said means between one position in which the plates do not compress the seal and another position in which said means force the plates towards each other so as to compress and expand the seal.

Preferably, an annular wear plate is interposed

between the cam means and said other plate.

A handle may be fixed to the wear plate.

Alternatively, the collar has fixed to it a leg adapted to contact the bore of a pipe at a point so spaced axially from said other plate as to locate the stopper at right angles to said bore and to provide a reaction to movement of the hand lever to pivot the cam means into said other position.

Preferably, the collar is adjustable in axial position along the spigot.

Preferably, also, the collar and the spigot have mating internal and external screw threads for the purpose of such adjustment.

The spigot may be axially extended and be surrounded by a tube interposed between the cam means and said other plate.

The tube has preferably fixed to it at least three radial arms of such a length as to centralise it in a pipe.

The hand lever may extend radially outside the expanded periphery of the seal.

In the case of the preceding paragraph, the handle preferably also extends radially outside the expanded periphery of the seal.

Preferably, means for remotely moving the hand lever from said other position to said one position comprise a

rope attached to said lever.

The invention will now be described, by way of example only, with reference to the accompanying diagrammatic drawings of which:-

Figure 1 is a side elevation of one embodiment of an expanding pipe stopper disposed in inoperative position in the mouth of a pipe, with parts broken away and one portion shown in axial cross-section;

Figure 2 is a plan view of part of the pipe stopper;

Figure 3 is a front elevation of said part of the pipe stopper;

Figure 4 is a part-sectional side elevation of another embodiment of an expanding pipe stopper disposed in operative position in the mouth of a pipe; and

Figure 5 is a plan view of part of said other embodiment.

Referring now to Figures 1 to 3 of the drawings, one embodiment of expanding stopper for pipes having larger bores over, say, nine inches in diameter comprises one rigid circular plate 10 having a small peripheral flange 12 and another rigid circular plate 14 of the same diameter as the plate 10 and having a small peripheral flange 16, the flanges 12 and 16 extending towards each other and serving to locate an annular rubber seal 18 between the two adjacent peripheral surfaces of said plates so as to project radially therefrom. The seal 18 is

convex in cross-section so as to be outwardly-expandable. A tubular spigot 20 is fixed as by welding 22 in a hole 24 in the centre of the plate 10, and extends through a central hole 26 in the plate 14. The spigot 20 has an externally screw-threaded zone 28, and a collar 30 is connected to said spigot on that side of the plate 14 remote from the plate 10 by a mating internal screw thread 32. The screw-threaded connection 28, 32 enables the collar 30 to be adjusted in axial position along the spigot 20 to suit slightly different pipe bore diameters. Cam means comprising two identical plates 34 are rotateably mounted on pins 36 projecting from respective diametrically-opposed flats 38 formed on the periphery of the collar 30, so as to be pivotable about a diametrical axis 40 on said collar, and the cam plates 34 are both fixed as by welding 42 to a U-shaped hand lever 44. An annular wear plate 46 is interposed between the cam plates 34 and the plate 14, and a T-shaped handle 48 is fixed as by welding 50 to said wear plate. Various materials, for example mild steel, stainless steel, aluminium or plastics, can be employed depending upon the chemical environment in which the pipe stopper is to be used.

In operation, the pipe stopper is disposed in the mouth of a pipe 52 as shown in Figure 1, the handle 48 is gripped in one hand and the hand lever 44 is gripped in

the other hand, and said handle and lever are forced apart so that said lever moves in the direction of the arrow 54 to pivot the cam plates 34 from their inoperative position illustrated in which the plates 10 and 14 do not compress the seal 18 into their operative position in which their surfaces 56 move into contact with the wear plate 46. This forces the plates 10 and 14 towards each other so as to compress the seal 18 and expand it outwardly into sealing contact with the bore of the pipe 52. A conventional end cap (not shown) can then be screwed onto the end of the spigot 20 if desired, a plain cap being used to seal the pipe or alternatively a cap with a nipple being used to enable the pipe to be tested in known manner by injecting water or air. The release of the stopper down a man-hole after it has caused a build-up of sewage is effected remotely by means of a rope (not shown) attached to the hand lever 44 which is pulled to return said lever to its inoperative position shown in the drawings. To enable the stopper to be installed at an appreciable distance inside a pipe, means for remotely manoeuvring it into the desired place and then moving the hand lever 44 from its inoperative position to its operative position comprise two rigid poles (not shown) one of which is releasably connected to said lever and the other of which is releasably connected to the handle 48.

In one modification of said one embodiment, the wear

plate 46 and handle 48 are omitted, the cam plates 34 bearing directly against the plate 14.

In another modification of said one embodiment which follows the known practice, the spigot is axially extended and is surrounded by a tube interposed between the cam plates and said other one of the rigid circular plates, and said tube has fixed to it as by welding three radial arms of such a length as to centralise it in a pipe. A wear plate with a handle fixed to it can be interposed between the cam means and the adjacent end of the tube, or said end of the tube can serve as a wear plate and have a handle fixed directly to it. This modification enables a pipe stopper of larger diameter to be installed further from the end of a corresponding pipe.

In a further modification of said one embodiment which enables a pipe stopper of smaller diameter to be installed further from the end of a corresponding pipe, the spigot is again axially extended and surrounded by a tube having radial arms, and in addition the hand lever and, if fitted, the handle extend radially outside the expanded periphery of the seal so that they can be manipulated outside the pipe with adequate leverage.

Referring now to Figures 4 and 5 of the drawings, another embodiment of expanding stopper for pipes having smaller bores up to, say, nine inches in diameter comprises one rigid circular plate 60 having a peripheral

seat 62 and another rigid circular plate 64 of the same diameter as the plate 60 and having a peripheral seat 66, the seats 62 and 66 facing each other and serving to locate an annular rubber seal 68 between the two adjacent peripheral surfaces of said plates so as to project radially therefrom. The seal 68 is convex in cross-section so as to be outwardly-expandable. A tubular spigot 70 is fixed as by welding 72 in a short tubular opening 74 formed integrally in the centre of the plate 60, and extends through a central hole 76 in the plate 64. The spigot 70 has an external screw thread 78, and a collar 80 is connected to said spigot on that side of the plate 64 remote from the plate 60 by a mating internal screw thread 82. The screw-threaded connection 78,82 enables the collar 80 to be adjusted in axial position along the spigot 70 to suit slightly different pipe bore diameters. Cam means comprising two identical plates 84 are rotateably mounted on pins 86 projecting from respective diametrically opposed points on the periphery of the collar 80, so as to be pivotable about a diametrical axis 88 on said collar, and the cam plates 84 are both formed integrally at the ends of a U-shaped hand lever 90. An inclined leg 92 is fixed to the collar 80 by permanently expanding a short tubular boss 94 formed integrally on said collar into a chamfered hole 96 formed in one end of said leg as shown in Figure 5. The leg 92 has a foot 98 at its other end for

a purpose hereinafter referred to.

In operation the pipe stopper is disposed in the mouth of a pipe 100, the foot 98 contacting the bore of said pipe at a point so spaced axially from said other plate 64 as to locate the stopper at right angles to said bore and to provide a reaction to one-handed movement of the hand lever 90 in the direction of the arrow 102 to pivot the cam plates 84 from one position (not shown) in which they are inoperative into another position shown in Figure 4 in which they are operative. In the inoperative position of the cam plates 84, the plates 60 and 64 do not compress the seal 68, but in the operative position of the cam plates 84 their surfaces 104 move into contact with said other plate 64 and thus force the plates 60 and 64 towards each other so as to compress the seal 68 and expand it outwardly into sealing contact with the bore of the pipe 100 as illustrated. As in the embodiment of Figures 1 to 3, a plain end cap or one with a nipple can then be screwed onto the end of the spigot 70, and a rope (not shown) can be attached to the hand lever 90 and pulled to effect remote release of the stopper. For installation at an appreciable distance inside a pipe, two rigid poles (not shown) can again be used, one releaseably connected to the hand lever 90 and the other releaseably connected to the leg 92.

In one modification of said other embodiment, an

annular wear plate is interposed between the cam plates 84 and the plate 64.

In an alternative modification of said other embodiment the plate 64, instead of being uniformly domed as shown, has a flat central area for engagement by the cam plates 84.

Further modifications are equally well applicable to both of the embodiments hereinbefore described.

In one such modification, the internal screw thread in the collar is omitted and the collar is adjustable in axial position incrementally along the spigot by means of a pin selectively engageable in a diametrical hole in the collar and in one of a series of axially-spaced diametrical holes in the spigot.

In another such modification which follows known practice, an additional plate having small peripheral flanges on both of its faces is freely slidable on the spigot between the two plates hereinbefore described, thus enabling two annular rubber seals to be provided in tandem so as to double the effectiveness of the pipe stopper whilst still employing a single cam means.

In a further such modification, said additional plate is replaced by two conventional plates rigidly secured together with their flanges remote from each other by a tube freely slidable on the spigot.

In yet another modification, the cam means of the

pipe stopper is arranged to be operated by hydraulic or pneumatic means to permit remote operation of the pipe stopper when it is located in a position in a pipe where manual operation is not feasible.

Claims:-

1. An expanding pipe stopper comprising two rigid circular plates of substantially the same diameter, an outwardly-expandable annular rubber seal located between the two adjacent peripheral surfaces of said plates so as to be capable of projecting radially therefrom, a spigot fixed to the centre of one of said plates and extending through a central hole in the other of said plates, a collar connected to the spigot on that side of said other plate remote from said one plate, and cam means pivotable about a diametrical axis on the collar by a hand lever fixed to said means between one position in which the plates do not compress the seal and another position in which said means force the plates towards each other so as to compress and expand the seal.

2. An expanding pipe stopper according to claim 1, wherein an annular wear plate is interposed between the cam means and said other plate.

3. An expanding pipe stopper according to claim 2, wherein a handle is fixed to the wear plate.

4. An expanding pipe stopper according to claim 1 or claim 2, wherein the collar has fixed to it a leg adapted to contact the bore of a pipe at a point so spaced axially from said other plate as to locate the stopper at right angles to said bore and to provide a reaction to movement of the hand lever to pivot the cam means into said other

position.

5. An expanding pipe stopper according to any one of the preceding claims, wherein the collar is adjustable in axial position along the spigot.

6. An expanding pipe stopper according to claim 5, wherein the collar and the spigot have mating internal and external screw threads for the purpose of such adjustment.

7. An expanding pipe stopper according to any one of the preceding claims, wherein the spigot is axially extended and is surrounded by a tube interposed between the cam means and said other plate.

8. An expanding pipe stopper according to claim 7, wherein the tube has fixed to it at least three radial arms of such a length as to centralise it in a pipe.

9. An expanding pipe stopper according to claim 7, wherein the hand lever extends radially outside the expanded periphery of the seal.

10 An expanding pipe stopper according to claims 3 and 9, wherein the handle also extends radially outside the expanded periphery of the seal.

11. An expanding pipe stopper according to any one of the preceding claims, having means for remotely moving the hand lever from said other position to said one position comprising a rope attached to said lever.

12. An expanding pipe stopper constructed, arranged and adapted to operate substantially as herinbefore described

with reference to, and as illustrated by, Figures 1 to 3 of the accompanying drawings.

13. An expanding pipe stopper constructed, arranged and adapted to operate substantially as herinbefore described with reference to, and as illustrated by, Figures 4 and 5 of the accompanying drawings.

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| Patents Act 1977<br>Examiner's report to the Comptroller under Section 17<br>(The Search report) | Application number<br>GB 9523007.4 |
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| **Relevant Technical Fields**<br>(i) UK Cl (Ed.O) F2P PTD, PTP<br>(ii) Int Cl (Ed.6) F16L 55/11, 55/12, 55/128, 55/132 | Search Examiner<br>R BINDING<br>Date of completion of Search<br>22 JANUARY 1996 |
| **Databases** (see below)<br>(i) UK Patent Office collections of GB, EP, WO and US patent specifications.<br>(ii) ONLINE WPI | Documents considered relevant following a search in respect of Claims :-<br>1-13 |

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| Category | Identity of document and relevant passages | | Relevant to claim(s) |
|---|---|---|---|
| X | GB 1231320 A | (TUTHILL) see page 1 line 54 to page 2 line 20 | 1, 2, 9 |
| X | DE 3910732 A1 | (THYSSEN) | 1, 2, 9 |
| X | DE 3718619 A1 | (THYSSEN) | 1, 9 |

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